

the strip 6 obtained after the first phase of the treatment process according to the invention may be subjected to a shear stress like that employed in a process for mechanical cutting of the strip. In this way it is possible to obtain, by cutting the strip 6, shaped components without any risk of fracturing the strip 1 made of nanocrystalline alloy which is fastened by its two faces to the covering strips 3 and 3' made of polymer material.

To obtain magnetic components having satisfactory properties, it is necessary for the strips with a nanocrystalline structure to have low internal stresses, these stresses being at a level as low as possible. This result can be achieved by carrying out the heat treatment of amorphous strips on a mandrel or a core having a large radius of curvature, as described above, or by using a furnace for heat treating the nonwound strip in a stress-free state, for example in a furnace for treating the strip laid flat on a support. The operations carried out on the nanocrystalline strip covered with two adherent layers of polymer create practically no stresses in the nanocrystalline strip, even if these operations entail large external stresses, such as sheer stresses.

The films 3 and 3' of polymer material precoated with adhesive, which are used to cover both sides of the strip 1, may consist of a film of a polymer material such as a polyester, a polytetrafluoroethylene (PTFE) or a polyimide, the film being combined with a layer of self-adhering material allowing the film to be bonded to the strip. Certain self-adhering materials may be crosslinked within a heat treatment unit like the unit 5 shown in figure 1.

Next, starting from laminated strips 6 each comprising a nanocrystalline strip covered on both its sides with strips made of polymer material, it is possible to manufacture a laminated composite comprising several superposed laminated strips 6 made to adhere to one another by pressure and/or by heat

treatment. In particular, such composites may be obtained from laminated strips 6 consisting of the nanocrystalline strip 1 covered on both its sides or on just one side with double-sided polymer strips, that is to say strips having self-adhering layers on both their sides.

Since the laminated or composite strips obtained no longer carry any risk of brittle fracture when cutting components, it is possible to produce, from these laminated or composite strips, any magnetic component, for example with the shape of a U or the shape of an E, or any magnetic component of complex shape used in watchmaking, as will be explained below.

The layers of polymer material used to cover the nanocrystalline strip are chosen so as to avoid degrading the magnetic properties of the nanocrystalline strips by the stresses induced during adhesion of the polymer strip to the nanocrystalline strip or during the operation of crosslinking the polymers in contact with the nanocrystalline strip. In general, measures will be taken to avoid subjecting the strip to a high tensile or compressive stress during the adhesion phase or the crosslinking phase.

However, in certain cases it is possible to adjust the magnetic properties of the laminate or composite consisting of one or more nanocrystalline strips by using the magnetostriction properties of the nanocrystalline strip or strips and by applying certain stresses to the nanocrystalline strips via the polymer-based layers.

In certain applications, for example in the case of components intended for the manufacture of energy conversion systems, the magnetic components obtained by the process of the invention must be able to withstand a relatively high temperature, for example a temperature of 150°C. In this case, of course, the polymers forming the covering layers of the nanocrystalline strip, which remain fastened to the magnetic components obtained after cutting, must

withstand the operating temperature of the magnetic components.

Instead of self-adhering covering strips made of a polymer material precoated with adhesive, it is possible to use as the layer for covering the nanocrystalline strips, a thermoplastic polymer film which does not become adhesive until a heat treatment. Such a thermoplastic film is called "non-tacky" because its thermoplastic part is not adhesive at room temperature.

Figure 2 shows one phase of a treatment according to the invention during which is produced a cuttable composite consisting of nanocrystalline strips and covering layers made of a polymer material which are bonded together by a thermoplastic material after a heat treatment.

As previously, strips made of nanocrystalline alloy are used, these generally being wound in the form of reels and obtained by treatment of a reel of alloy in the amorphous state. Each of the strips of nanocrystalline alloy used for the manufacture of the composite is covered, on its upper side and on its lower side, with a thermoplastic polymer film precoated with adhesive. Thus, a plurality, for example three, of laminated strips 7a, 7b, 7c are produced, each comprising a strip made of nanocrystalline alloy placed between two polymer films. The strips 7a, 7b and 7c are made to run through a heating chamber 8 at a temperature of less than 400°C, which raises the temperature of the thermoplastic films of the layers for covering the laminated strips 7a, 7b, 7c to above the melting point of the thermoplastic film and above the contact bonding temperature. The bonding of the strips 7a, 7b and 7c is carried out between two press rolls 9a and 9b. After cooling in a cooling chamber 10, a composite strip 11 is obtained which can be cut into the form of shaped magnetic components.

The thermoplastic films allowing adhesion of the covering layers may consist of one of the following